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ABSTRACT

This report discusses an ex post facto study that was done to examine the effect that the implementation of automated systems has had on libraries and support staff, labor costs, and productivity in the cataloging divisions of the library of the University of British Columbia. A comparison was made between two years: 1973, a pre-automated period when a comprehensive set of job descriptions for library positions had been written; and 1986, when an in-house automated cataloging system was in place. A discussion of certain assumptions and limitations that apply to the study is followed by an extensive review of the related literature. The experience of the library's cataloging divisions with automation is then reviewed in an attempt to answer seven research questions. Data required for the study were obtained from library and personnel department records. Analyses of these data indicated that automation in this library had the following effects: (1) an increase in the number of librarians; (2) a decrease in the number of support staff; (3) an increase in the ratio of librarians to support staff; (4) changes in duties and responsibilities of librarians and support staff; (5) apparently reduced labor costs; and (6) increased productivity. Appendixes contain organization diagrams for 1973 and 1986 as well as 12 tables displaying the results of the data analyses. (51 references) (CGD)

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The Effect of Automation on Job Duties, Classifications, Staffing Patterns, and Labor Costs in the UBC Library's Cataloguing Divisions: a Comparison of 1973 and 1986.

by

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December 10, 1986

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Introduction

In a time of shrinking financial resources, the control of costs and the improvement of productivity are of prime importance to library managers. For academic research libraries, staff salaries are the most significant part of the budget, and, given the fact that funding for collections and materials is never adequate (and usually politically untouchable), the only part of the budget which offers any possibility for economies. Labor costs are determined by the number and type of staff employed, are subject to continuing inflation, and are further affected by wage and benefit increases which occur as a result of collective bargaining. The possibility that the use of automated systems can improve productivity, change the number or type of staff employed, and perhaps reduce labor costs should therefore be of great interest to library managers. Potential salary savings from technical services areas such as cataloguing where automation is typically implemented, could produce the financial resources to meet demands for new services in a period of frozen budgets, or enable the library to deal with retrenchment and staff cuts without reducing services to users.

The literature which examines the effects of automation on staffing patterns, productivity, and labor costs in library technical services departments yields inconclusive and sometimes contradictory evidence. Little quantitative research has been carried out in this area, and what is published tends to be theoretical or philosophical. An *ex post facto* study of the experience of a major academic library should therefore be useful. This study examines the effect that the implementation of automated systems has had on job duties of librarians and support staff, support staff classifications, the relative numbers of librarians and support staff, labor costs, and productivity, in the cataloguing divisions of the University of British Columbia Library. A comparison is made between two years, 1973 and

1986. These years were selected because 1973 marked the production of a comprehensive set of job descriptions for Library positions during the pre-automation period and thus provides a snapshot of Library jobs at that time, while by 1986 the process of automating cataloguing was essentially finished, and an in-house automated cataloguing system was in place.

Certain assumptions and limitations apply to this study. The internal reorganization of the cataloguing divisions between 1973 and 1986 has generally been ignored, except where it has affected the level of staffing or the functional responsibilities of the divisions. It is assumed that positions eliminated from the establishment of the cataloguing divisions after the introduction of automation, other variables being controlled, were eliminated as a result of automation. This elimination may not have happened as a direct cause-and-effect - there is always work waiting to be done and staff can always be kept busy - but as a result of retrenchment or imposed staff cuts. As Atkinson and Stenstrom state, "cost savings will not appear magically. They will have to be forced into existence by library managers."[1] What is assumed is that the ability of the cataloguing divisions to eliminate positions is an effect of the implementation of automated systems.

No consideration has been given to the capital and operating costs of the automated systems. These would have to be analyzed to determine the overall cost-effectiveness of the implementation of automation. Capital and operating costs might very well exceed any reductions in labor costs, or outweigh gains in productivity. Finally, the study is limited to events which occurred in the cataloguing divisions of the UBC Library and may not necessarily be indicative of the experience of other academic research libraries.

[1]Hugh C. Atkinson and Patricia F. Stenstrom, "Automation in Austerity," *Austerity Management in Academic Libraries*, Ed. by John F. Harvey and Peter Spyers-Duran, (Metuchen: Scarecrow, 1984), p. 281-2.

Review of the Literature

Why have libraries adopted automated systems, especially in technical services? According to McLean, "[t]here appear to be two basic aims behind the desire to automate library processes: (i) to be more efficient in what is already being done and (ii) to offer services and support which could not be achieved manually."[2] The desire to improve efficiency resulted from problems in maintaining the card catalogue. Reynolds points out that, as acquisitions budgets grew, maintenance of the card catalogue fell behind, as there were not enough staff to keep up with the increased number of cards to file.[3] Catalogues were increasing in size, occupied more and more space, and were physically wearing out with use. When branch libraries were established, whole new catalogues had to be created and then maintained, both operations being expensive in terms of staff costs. He notes that the growing complexity of cataloguing rules and increasing adherence to standards made card catalogue maintenance even more difficult. "[T]he task of modifying any piece of information about an item required considerable duplication of effort...Making a change in terminology for a frequently assigned name or subject heading was a task of prohibitive dimension, requiring changes to large numbers of author, title, and subject entries...The most convenient solution for the library was simply not to change terminology."[4]

Veaner feels that it was not the potential of the computer which caused libraries to close their card catalogues, but rather that the relentless pressure of increasing labor costs forced libraries to turn to the computer as the only alterna-

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[2]Neil McLean, "Computerisation and Library Organisation," *The Management of Technical Innovation in Libraries: Proceedings of a Conference*, (Loughborough: Centre for Library and Information Management, 1981), p. 7.
[3]Dennis Reynolds, *Library Automation: Issues and Applications*, (New York: Bowker, 1985), p. 73.
[4]Reynolds, *Library Automation*, p. 73-4.

tive.[5] According to Reynolds, "computer-generated catalogs proved to be...a more cost-effective form of catalog."[6] He agrees that the potential of the computer was often not used to improve upon the card catalogue. "The level of bibliographic description provided and the depth of access to materials in computer-generated...microform catalogs seldom departed from the established practices of card catalogs."[7] McLean applies this view to cataloguing operations generally, noting that "the actual functions of technical services departments have not yet radically changed in nature because most of the existing computerised systems reflect the traditional aspects of conventional manual cataloguing techniques."[8]

In a survey of four American academic libraries, Cain found that only at the University of Illinois had the implementation of automation involved a major reorganization of the library that moved away from traditional patterns. "The cataloging department essentially has been disbanded and replaced with a processing unit, composed of para-professionals, that searches OCLC for cataloging copy. The professional catalogers have been dispersed to different public service units. A librarian's duties now will be organized by scholarly discipline rather than by function, that is, each professional will provide an array of technical and public services, from book selection and cataloging to reference and data base searching, with particular responsibility for a narrowly defined set of academic subjects."[9] Cummings notes that "there is little specific evidence that the introduction of computer technologies into library operations has effected significant cost savings. The University of Illinois estimates that the cost of maintaining an online catalog

[5]Allen B. Veaner, "What Hath Technology Wrought?" *Proceedings of the 1978 Clinic on Library Applications of Data Processing: Problems and Failures in Library Automation*, Ed. by F.W. Lancaster, (Urbana-Champaign: University of Illinois, 1979), p. 10.
[6]Reynolds, *Library Automation*, p. 88.
[7]Reynolds, *Library Automation*, p. 88.
[8]McLean, "Computerisation," p. 8.
[9]Mark E. Cain, "Research Libraries in Transition: Managing in the University Setting," in Martin M. Cummings, *The Economics of Research Libraries*, (Washington: Council on Library Resources, 1986), p. 182-3.

is only slightly less than the cost of maintaining a public card catalog."[10] He observes that "the financial pressures on libraries are great enough to motivate the adoption of computer cataloging--a choice that can also be justified on the grounds of improved quality of services and the grounds that everybody else is doing it. The pressures are not yet great enough to compel each library to find the least expensive means for carrying out the technical operations."[11]

Pringle points out that improved bibliographic access and control and the consequent gains for scholarship are just as important as potential cost savings.[12] Ross agrees. "More recently, library managers have justified the installation of automated library systems by citing such factors as improved service to the library patrons and reduced processing times. Today, less emphasis is placed on cost reductions achieved by using computers to perform clerical tasks in libraries."[13] As well, there may be a direct cost saving to library users which is difficult to quantify and which does not show up in the bottom line of the technical services budget. Murray notes that automation "can also increase individual productivity, particularly because computerized catalog records are no longer location-bound, which implies considerable savings possible in internal staff and user travel time. Access time cost in obtaining information is frequently overlooked...Automation implications for service point reorganization are startling and have scarcely begun to be

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[10]Martin M. Cummings, *The Economics of Research Libraries*, (Washington: Council on Library Resources, 1986), p. 103.
[11]Cummings, *Economics*, p. 28.
[12]Reg Pringle, "The Effects of Inter-Library Co-operation on the Priorities of Individual Libraries," *The Management of Technical Innovation in Libraries: Proceedings of a Conference*, (Loughborough: Centre for Library and Information Management, 1981), p. 25.
[13]Ryburn M. Ross, "Cost Analysis of Automation in Technical Services," *Proceedings of the 1976 Clinic on Library Applications of Data Processing: The Economics of Library Automation*, Ed. by J.L. Divilbiss, (Urbana-Champaign: University of Illinois, 1977), p. 11.

grasped, yet they are more important in managing scarce resources than the long-hoped-for direct catalog and circulation personnel savings."[14]

Boss feels that "improved services are a more compelling reason to automate than are possible reductions in costs,"[15] and that there "is little evidence that libraries have reduced the sizes of their staffs as a result of automation."[16] Cline and Sinnott, in a study of technical services at three American university libraries, found that while staff reductions occurred in some areas, notably card typing,[17] no substantial cost savings through staff reductions were realized and might very well not occur.[18] Veneziano and Aagaard, in commenting on the application of automation to cataloguing operations at Northwestern, concur with this view, and also raise the problem of inter-institutional comparison. "Although we have virtually eliminated the typing and reproduction of catalog cards, thus cutting our clerical costs, we have not been able to cut the cost of the cataloging operation itself. Frankly, we are skeptical of claims of large cost savings. We suspect that the transition to OCLC has given administrators an opportunity to make changes...which by themselves would have increased productivity. Such improvements did not accompany the changeover to automation at Northwestern because we had already streamlined our cataloging operations."[19] Ross notes as well that comparisons between institutions are rarely valid, as different techniques are used in different cost studies.[20] A comparison of an inefficient manual system with an efficient au-

[14]Murray S. Martin, "Cost-Benefit Analysis for Austerity," *Austerity Management in Academic Libraries*, Ed. by John F. Harvey and Peter Spyers-Duran, (Metuchen: Scarecrow, 1984), p. 244.
[15]Richard W. Boss, *The Library Manager's Guide to Automation*, 2nd ed. (White Plains: Knowledge Industry Publications, 1984), p. 7-8.
[16]Boss, *Library Manager's Guide*, p. 101.
[17]Hugh F. Cline and Loraine T. Sinnott, *The Electronic Library; the Impact of Automation on Academic Libraries*, (Lexington: D.C. Heath, 1983), p. 159.
[18]Cline and Sinnott, *Electronic Library*, p. 145.
[19]Velma Veneziano and James S. Aagaard, "Cost Advantages of Total System Development," *Proceedings of the 1976 Clinic on Library Applications of Data Processing: The Economics of Library Automation*, Ed. by J.L. Divilbiss, (Urbana-Champaign: University of Illinois, 1977), p. 137.
[20]Ross, "Cost Analysis," p. 10.

tomated system may show substantial savings in terms of staff costs, but the role played by automation in reducing those costs is obscured.

Pierce and Taylor observe that the "basic goals of all major automated cataloging schemes is to reduce the amount of original cataloging by providing copy...[as] it is less expensive to catalog a book with copy."[21] They point out that "potential major savings over a manual system will occur in personnel changes that come about by trading professional positions for library assistant positions or by reducing clerical positions."[22] They caution however, that "[n]o clear data exist from which one may predict either savings or cost increases due to changes in personnel after installation of an automated system."[23]

Kraske, in a study of the effect of automation on technical services at Indiana State University, while noting the difficulty of establishing a direct relationship between automation and staff reductions, did find that automated operations led to a reduction of two cataloguers,[24] and that the "overall effect of automation has been a savings in labor costs in the library."[25] Unfortunately, his study does not include cost figures or comparisons. Hegarty and Atkinson feel that labor costs can be reduced through automation, and that the resulting savings can be used to support other services[26] or to meet external demands for budget cuts.[27] Getz and Phelps state that "the scope for reduction of labor costs in technical ser-

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[21]Anton R. Pierce and Joe K. Taylor, "A Model for Cost Comparison of Automated Cataloging Systems," *Journal of Library Automation* 11 (March 1978):6.
[22]Pierce and Taylor, "A Model," p. 7.
[23]Pierce and Taylor, "A Model," p. 7.
[24]Gary Kraske, The Impact of Automation on the Staff and Organization of a Medium-Sized Academic Library: a Case Study, Microfiche, ERIC ED190153, (Terre Haute: Indiana State University, 1978), p. 8.
[25]Kraske, Impact of Automation, p. 13.
[26]Kevin Hegarty, "Myths of Automation," *Library Journal* 110 (October 1, 1985):45.
[27]Hugh C. Atkinson, "Personnel Savings through Computerized Library Systems," *Library Trends* 23 (April 1975):590.

vices due to automation is relatively limited as long as libraries continue to acquire and own materials in traditional ways."[28]

Veaner feels that libraries have failed to realize significant staff savings through automation, especially in cataloguing.[29] He points out that "as computers and systems become more sophisticated, they require an ever-increasing staff of highly sophisticated and expensive software people for maintenance and development. The rise of this personnel component of the computer far offsets any personnel savings in actual library operations."[30] He also notes another reason why savings may not occur. "Ignoring the self-generating character of automated systems has further contributed to the failure to achieve cost savings; success breeds accelerated use. Increased use costs more money, so the bottom line is bigger. An automated system is always required to do more than the manual system it replaced; it is this "doing more" which costs more."[31]

The ratio of librarians to support staff has an impact on labor costs, as professional salaries tend to be considerably higher. There appears to be some agreement that the ratio of cataloguers to support staff will decrease. Morita and Kaye, in a study of the cataloguing system at the Ohio State University libraries, found that the number of librarians shrank from 23 to 16, while the number of support staff grew from 25.75 to 37.3.[32] Kraske also noted, that while professional positions were reduced, the number of clerical staff increased.[33] Atkinson feels that shared intellectual activity in cataloguing between libraries will result in professional staff savings.[34] Getz and Phelps ascribe cost reductions in cataloguing to

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[28]Malcolm Getz and Doug Phelps, "Labor Costs in the Technical Operation of Three Research Libraries," *Journal of Academic Librarianship* 10 (September 1984):217.
[29]Veaner, "What Hath," p. 6.
[30]Veaner, "What Hath," p. 6.
[31]Veaner, "What Hath," p. 6.
[32]Ichiko T. Morita and D. Kaye Gapen, "A Cost Analysis of the Ohio College Library Center On-Line Shared Cataloging System in the Ohio State University Libraries," *Library Resources & Technical Services* 21 (Summer 1977):300.
[33]Kraske, Impact of Automation, p. 9.
[34]Atkinson, "Personnel Savings," p. 589.

the use of national utilities and a decrease in original cataloguing.[35] Cummings notes that "the principal effect of online bibliographic services has been to reduce the need for local cataloging. This has allowed directors to shift personnel from cataloging to other library work."[36] Horny points out that the "availability for on-line bibliographic copy offers greater opportunities for the use of paraprofessionals,"[37] and that the librarians remaining in technical services are increasingly performing managerial and supervisory duties.[38] Baldwin notes that as the 'hit -rate' for cataloguing copy improves, there is less of a need for professional librarians to perform original cataloguing.[39] Holley[40] and Estabrook[41] agree that fewer original cataloguers will be needed in the future.

A similar decline in professional staff combined with an increase in clerical staff was found by Lowry in a study of on-line data base producers in the U.S.[42] A 1977 survey of head cataloguers of U.S. academic libraries by Spyers-Duran "revealed that 51 percent of the libraries reduced their professional staff after automation. Only 35 percent of the same group reduced support staff."[43] This parallels the findings of Molyneux, who noted a substantial drop in the ratio of librari-

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[35]Getz and Phelps, "Labor Costs," p. 217.
[36]Cummings, *Economics*, p. 53.
[37]Karen L. Horny, "Managing Change: Technology and the Profession," *Library Journal* 110 (October 1, 1985):57.
[38]Karen L. Horny, "Quality Work, Quality Control in Technical Services," *Journal of Academic Librarianship* 11 (September 1985):209.
[39]Paul Baldwin, Implementation of the GEAC Library Information System and Its Organizational Impact on the Simon Fraser University Library, (Paper prepared for the Autumn, 1985 meeting of the Washington and Oregon Chapters of the Association of College and Research Libraries, Pack Forrest, Washington), p. 10.
[40]Robert P. Holley, "The Future of Catalogers and Cataloging," *Journal of Academic Librarianship* 7 (May 1981):93.
[41]Leigh Estabrook, "The Human Dimension of the Catalog: Concepts and Constraints in Information Seeking," *Library Resources & Technical Services* 27 (January/March 1983):72.
[42]Glenn R. Lowry, "Staffing Trends among US Online Database Producers-Longitudinal Change and Growth-1982-1984," *Online Review* 9 (1985):221.
[43]Peter Spyers-Duran, "The Effects of Automation on Organizational Change, Staffing, and Human Relations in Catalog Departments," *Requiem for the Card Catalog: Management Issues in Automated Cataloging*. Ed. by Daniel Gore, Joseph Kimbrough, and Peter Spyers-Duran, (Westport: Greenwood Press, 1979), p. 35.

ans to support staff in ARL libraries during the period 1962/63 to 1983/84.[44] He offers two possible explanations: "1. The ratio has fallen as a result of the automation of library processes. As these libraries became more automated, nonprofessionals could replace professionals in various tasks. 2. Library directors found ways of replacing relatively expensive professionals with cheaper nonprofessionals."[45]

Berman however, feels that automation will result in a need for more professional cataloguers to improve mass production cataloguing and to create a catalogue at the local level which will make the collection more accessible to users.[46] Marshall agrees, noting that "name and subject authority work must be done...[and that] substandard cataloging data in a cooperatively developed data base must be brought up to standard."[47]

Horny points out that "[f]or both professionals and nonprofessionals, working with current national standards in a network context is often more demanding than prior methods of operation."[48] She notes that library assistant positions often have to be reclassified to higher levels and higher salaries, increasing costs where automation is supposed to save money.[49] Veaner observes that "another consequence [of automation] has been across-the-board reclassification of operating personnel with greater total personnel cost resulting even when the staff is reduced."[50] Kraske found that a number of support staff positions were upgraded,[51] and that these positions required more skills, experience, and training.[52] Spyers-Duran reported considerable change for support staff. "Changes in work assignments re-

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[44]Robert E. Molyneux, "Staffing Patterns and Library Growth at ARL Libraries, 1962/63 to 1983/84," *Journal of Academic Librarianship* 12 (November 1986):296.
[45]Molyneux, "Staffing Patterns," p. 296.
[46]Sanford Berman, quoted in "Automated Cataloging: More or Less Staff Needed?" *Library Journal* 103 (February 1978):415.
[47]Joan K. Marshall, "Don't Fire Catalogers," *Library Journal* 103 (August 1978):1450.
[48]Horny, "Managing Change," p. 57.
[49]Horny, "Managing Change," p. 57.
[50]Veaner, "What Hath," p. 6.
[51]Kraske, Impact of Automation, p. 10.
[52]Kraske, Impact of Automation, p. 13.

sulted in expansion of duties and a greater independence for those who work on computer terminals."[53] Cline and Sinnott note that as more ways are found to exploit the capabilities of new technology, job specifications of staff keep changing, although they question whether the mere use of a terminal implies a change in the level of the work.[54] Atkinson feels that often the old and new technologies are equated, and that changes in responsibility are often not rewarded by appropriate increases in classification or salary.[55] "The inability to recognize that a new technology may require a new form of judgment seems endemic to many personnel systems."[56]

In a survey of library staff on the effects of automation, Dakshinamurti found that 10% of respondents "expressed reservations about being called upon to take more responsibility without being paid for it."[57] She notes that many library staff members expect considerable change in the structure of their jobs.[58] A trend of upgrading is found as well in Piternick's study of interlibrary loan operations in Canadian libraries, where she reports that in 10 of 28 academic and research libraries surveyed, technological changes had led to the upgrading of support staff positions.[59] She points out that there probably has not been as much reclassification as the changes in duties of staff members would warrant.[60] Henshaw noted in a review of his interlibrary loan unit that after automation a position had to be upgraded, and that through a comparison of old and new job descriptions, it was

[53]Spyers-Duran, "Effects of Automation," p. 31.
[54]Cline and Sinnott, *Electronic Library*, p. 157.
[55]Hugh C. Atkinson, "Who Will Run and Use Libraries? How?" *Library Journal* 109 (October 15, 1984):1905.
[56]Atkinson, "Who Will Run," p. 1906.
[57]Ganga Dakshinamurti, "Automation's Effect on Library Personnel," *Canadian Library Journal* 42 (December 1985):348.
[58]Dakshinamurti, "Automation's Effect," p. 351.
[59]Anne B. Piternick, "ILL Meets Technology," *Canadian Library Journal* 42 (October 1985):271.
[60]Piternick, "ILL," p. 271.

clear that a major change had occurred in the skills that staff members needed in the automated environment.[61]

The effect of automation on productivity is often difficult to determine. Reorganization, new patterns of work flow and other factors also affect productivity. As with costs, inter-institutional comparisons are not particularly helpful as the data provided is not standardized. McLean points out that "[c]omputerisation has added a new dimension in that the degree of quality control required is higher than in a manual system."[62] Ross noted that output per cataloguer increased at Cornell after use of OCLC commenced, even though the number of cataloguers was reduced by almost three positions.[63] Spyers-Duran reported that the introduction of automation led to "improved work flow...reduced backlogs, and increased productivity."[64] Dobrovits found a substantial increase in the productivity of professional cataloguers. "Between 1963 and 1983 cataloguing productivity increased 100%. This would not have been possible without computerization."[65] But Massil cautions that "the residue of original cataloguing for the library's non-MARC material may require greater cataloguing effort than before."[66] Lovecy points out that original cataloguers "are left with only those books for which records cannot be obtained--arguably the most challenging, and those on which their professional skills should rightly be brought to bear, but also the most difficult and least rewarding."[67]

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[61]Rod Henshaw, "Library to Library," *Wilson Library Bulletin* (April 1986):44.
[62]McLean, "Computerisation," p. 8.
[63]Ross, "Cost Analysis," p. 24.
[64]Spyers-Duran, "Effects of Automation," p. 31.
[65]P. Dobrovits, "Computerization and the Future of ABN in the UNSW Library," *Australian Academic & Research Libraries* 16 (September 1985):141.
[66]Stephen W. Massil, "Administrative, Organizational and Economic Effects of Automated Cataloguing," *Studies in Library Management*, v. 7, Ed. by Anthony Vaughan, (London: Clive Bingley, 1982), p. 89.
[67]Ian Lovecy, *Automating Library Procedures: a Survivor's Handbook*, (London: Library Association, 1984), p. 152.

Marko agrees that "[c]ataloging itself has become much more difficult and complex with the advent of computer-based network cataloging."[68] She feels that "catalogers, by and large have not educated library administrations or others when looking at output or other quantifiable measures as to the amount of time, effort and the increased complexity of their activities and...that the high quality/volume standards of the past generations can no longer be maintained."[69] Ross reports that "[i]t is the opinion of Cornell's cataloging staff that original cataloging takes substantially more time than it did with the manual system."[70]

Reynolds notes that "the MARC II format has become the predominant basis for the representation of machine-readable bibliographic information in cataloging systems."[71] It is used by national cataloguing authorities and by the major utilities. Yet as Lovecy points out, "the greatest objection to MARC, and the one hardest to answer, is the complexity of the structure."[72] Even experienced cataloguers are not completely familiar with every field and subfield or how to use them. MARC "is in no sense 'user-friendly.'"[73] The requirement to follow new and complex standards takes additional time and skill on the part of the cataloguer, and may tend to reduce productivity and increase labor costs. Veaner notes that "[h]ighly restrictive protocols for person/machine communication impose huge training loads and require massive amounts of documentation."[74] Continuing changes in procedures and systems or a move to another utility can increase training loads and reduce productivity.

Finally, productivity can be affected by morale. Automation changes the way people work. Lovecy notes that "if records are being obtained from outside

[68]Lynn Marko, [Letter to the Editor], *Journal of Academic Librarianship* 7 (September 1981):235.
[69]Marko, [Letter to the Editor], p. 235.
[70]Ross, "Cost Analysis," p. 23.
[71]Reynolds, *Library Automation*, p. 273.
[72]Lovecy, *Automating*, p. 85.
[73]Lovecy, *Automating*, p. 86.
[74]Veaner, "What Hath," p. 6.

sources and used with as little modification as possible, the traditional cataloguer may well feel his or her position threatened. No longer will they be the priest of an arcane but vital religion without which the library cannot function."[75] He feels that where automation has affected professional work "its effect may well have been to reduce only slightly the number of staff required in the operation, but to cut drastically the degree of professional input, of decision-making and of autonomy."[76]

Research Questions

The literature, while not definitive, suggests that the implementation of automated systems in cataloguing may have the following effects on staff, job classifications, job duties, labor costs, and productivity:

1) There may be a reduction in the number of librarians, especially original cataloguers.

2) There may be a reduction in the number of support staff, especially junior clerical staff, although in some cases support staff numbers increase.

3) There may be a reduction in the ratio of librarians to support staff.

4) Librarians may have more managerial and supervisory responsibilities.

5) There may be changes in the duties and responsibilities of support staff which in some instances may lead to higher job classifications and increases in salary.

6) There may be a reduction in overall labor costs.

7) There may be an increase in both individual and overall productivity, but original cataloguing productivity may decline.

From these, the following questions can be formulated:

1) Has there been a change in the number of librarians attributable to automation?

2) Has there been a change in the number of support staff attributable to automa-

[75]Lovecy, *Automating*, p. 152.
[76]Lovecy, *Automating*, p. 162.

tion? Does this vary from classification to classification?

3) Has the ratio of librarians to support staff changed because of automation?

4) Have the duties and responsibilities of librarians changed because of automation? How have supervisory and managerial responsibilities been affected?

5) Have support staff duties and responsibilities changed because of automation? How have changes affected job classifications?

6) Has there been a change in staff labor cost attributable to automation?

7) Have there been changes in productivity attributable to automation?

This study reviews the experience of the UBC Library cataloguing divisions with automation in an attempt to answer these questions.

The UBC Library

The University of British Columbia Library, located in Vancouver, is a large academic research library organized by function and subject. Technical services, including the cataloguing divisions, operate from the Library Processing Centre, and provide services to the entire Library system.

In 1973, the cataloguing divisions consisted of three divisions, each with its own head, which reported to the Head of the Cataloguing Divisions (see Figure 1). The Original Cataloguing Division consisted of original cataloguers (librarians) and Library Assistants 4 with specialized language or subject backgrounds, as well as an Added Volumes section. The division was responsible for original cataloguing, the cataloguing of other editions, the derivative cataloguing of specialized material, serials cataloguing (original and derivative) and the processing of added volumes. The LC Cataloguing Division consisted mainly of Library Assistants 3 who were responsible for the processing of materials for which catalogue copy was available, bibliographic searching (including pre-order and pre-cataloguing searching), and the processing of added copies. The Catalogue Preparations Division con-

sisted of four sections. A small Catalogue Maintenance section was responsible for subject heading control and the training of filers for the Main Library public catalogues. The Revision section, consisting of Library Assistants 4, was responsible for the revision of filing in the Main Library and branch catalogues, and for error correction. The Card Preparation section, consisting mainly of Library Assistants 2, produced stencils and pasted-up masters for card production, typed headings on individual cards, and sorted and filed cards. The Book Preparation section, consisting mainly of Library Assistants 1, was responsible for the physical marking and processing of library materials, the sorting and filing of cards, and for the production of keypunched book cards.

A manual cataloguing system was still in operation, with considerable use being made of cataloguing data available in card or printed form, mainly from the Library of Congress. Catalogue cards were produced by photocopying typed stencils, or pasted-up masters using LC cards or Polaroid photographs of NUC entries. A union author/title and a subject card catalogue were located in the Main Library, as well as a location file. Individual branch libraries and some subject divisions maintained their own author/title and subject catalogues, as well as shelflists. In addition, the cataloguing divisions maintained an authority file, a union shelflist, and various depository control files containing cards received from the Library of Congress. Card filing was done mainly by Library Assistants 1 and 2 and by student assistants. The filing was revised by librarians and Library Assistants 3 and 4.

In 1975/76, the cataloguing divisions underwent a major re-organization. The administrative hierarchy was flattened, and the three divisions were transformed into two (see Figure 2). The heads of these divisions now reported directly to the Assistant University Librarian for Technical Services. The Catalogue Records Division assumed most of the responsibilities of the former Original Cat-

aloguing and LC Cataloguing Divisions, with the exception of added copies and volumes processing. Librarians and support staff were re-organized into subject or language units with each unit headed by an original cataloguer. The Catalogue Products Division took over the responsibilities of the former Catalogue Preparations Division as well as added copies and volumes processing.

The implementation of the use of the services of the Canadian bibliographic utility, UTLAS, in 1978 marked the beginning of the process of automation in cataloguing. Original and derivative cataloguers became familiar with the intricacies of MARC coding and the use of cataloguing data in machine-readable form. Card production and card filing ceased, except for non-roman alphabet material and the cataloguing working files. The public card catalogues were closed, new material was listed in a computer-output microfiche (COM) catalogue, and access to in-process material (including items received but not yet catalogued as well as items recently catalogued) was available through another COM file.

In 1985 the UBC Library implemented an in-house cataloguing system, following the failure, through lack of funding, of an initiative to establish a provincial cataloguing utility. The decision to develop an in-house system and acquire a Library mainframe computer came as a result of escalating costs for the use of UTLAS, and a cost-benefit analysis of the services of other utilities as well as of turnkey systems. The UBC cataloguing system now provides access to the MARC database and other sources of machine-readable cataloguing data, including the National Library of Canada, UTLAS, and OCLC.

Methods and Procedure

The data required for the study was obtained from the Library's budgets, personnel establishments, professional and support staff job description manuals, and cataloguing production statistics for each year. First of all, the number of librarians and support staff (including student assistants as FTE positions) was determined for each of the Library's major functional areas (Administration, Collections, Public Services, Technical Services) for 1973 and 1986. As well, the number of hours actually worked were determined for each area for each year. The comparison of the two years is shown in Table 1, and provides a baseline against which the changes in the level of staffing in the cataloguing divisions can be measured.

A major consideration in comparing staffing levels in the cataloguing divisions between 1973 and 1986 was to make adjustments to staff figures that would eliminate variation caused by changes in the functional responsibility of the divisions. To determine the staff of the cataloguing divisions in 1973, an initial staff list was derived from the 1973 professional and support staff job description manuals. This initial listing was then compared with the personnel establishments and Library budgets for fiscal 1972/73 and fiscal 1973/74 to ensure that no positions had been overlooked, and to derive the number of full-time equivalent (FTE) student assistants. As a result of this comparison, four positions were identified in the then Asian Studies Division which were added to the staff of the cataloguing divisions to ensure a valid comparison with 1986 staffing levels. These positions, the Chinese and Japanese Cataloguers and the Chinese and Japanese Cataloguing Assistants, as well as their duties and responsibilities, were in fact formally transferred to the Original Cataloguing Division in 1974, and have continued to be part of cataloguing since then. In addition, three positions were identified which were

removed from the 1973 figures. These positions - three Added Volumes Assistants - as well as their duties and responsibilities, were later transferred to the Serials Division when that division assumed responsibility for serials added volumes, and were no longer part of the cataloguing establishment in 1986.

Staffing levels for 1986 were determined from the listing for the Catalogue Records and Catalogue Products Divisions in the 1986 Library Establishment. These figures were then compared with the current professional and support staff job description manuals, and the current budget, to ensure that all positions were accounted for, and to derive the number of FTE student assistants. The present establishment was then reviewed to determine if any positions with new responsibilities had been added since 1973 in addition to the Asian Studies positions mentioned above. It was found that one Library Assistant 4 and two Library Assistant 2 positions had been transferred to the Catalogue Records Division from the former Reading Rooms Division in 1982, when the Library ended most of its support for departmental and faculty reading rooms. Some reading room-related duties were transferred with these positions. Discussion with the Head of the Catalogue Records Division revealed that only 25% of the time of the Library Assistant 4 and only 10% of the time of one of the Library Assistants 2 was devoted to reading room duties. The remainder of the time was spent in normal cataloguing activities, and thus represented an increase in staff. The 1986 staffing figures were accordingly reduced only by the fraction of time spent on reading room duties. Table 2 provides a comparison of the number of cataloguing staff in 1973 and 1986 by classification and shows the changes which occurred.

To determine the effect that these changes have had on each classification as well as on the pattern of staffing, the proportion of cataloguing staff in each classification was calculated for 1973 and 1986. Table 3 shows the results of this calculation. The ratio of librarians to support staff in the cataloguing divisions

was calculated for both years from the figures given in Table 2. The change in this ratio was compared to the change in the ratio of librarians to support staff in each of the functional areas of the Library, and the results listed in Table 4.

Positions in each classification were examined in further detail to analyse how the changes shown in Tables 2 and 3 had come about. By comparing 1973 positions to the 1986 cataloguing establishment and the establishment for the remainder of the Library, positions which had been eliminated from the Library, added to the cataloguing divisions, or transferred to other Library units, were identified. At the same time, it was possible to determine how positions in each classification had been affected by upward or downward reclassification. Dates for each of these changes were then determined in order to isolate the changes resulting from automation. Obviously, those changes which occurred before the implementation of automation in 1978 were not affected by it. But changes which occurred during and after 1978 required closer study to identify those which could be related to the effects of automation. An examination of budget documents, reclassification requests, job descriptions, and proposals related to the operating costs of the automated systems, assisted in identifying these. The changes in staff numbers due to automation as well as to other reasons are listed for each classification by type of change in Tables 5.1 to 5.5. The total effect on staffing levels of these changes was examined, and the results of this examination are provided in Table 6.

A task analysis of the job duties of each position in each classification was carried out by comparing the 1973 and 1986 job descriptions. Changes in responsibilities, duties, qualifications, and terminology attributable to automation were determined, as well as changes in the number of job descriptions. The results were consolidated in a classification by classification comparison. Special attention was given to automation-related changes in classification as determined from Tables 5.3 and 5.4. In addition, support staff standard job descriptions (which are in fact

the grade definition or classification standard for each level) were examined for changes resulting from automation.

To yield a meaningful comparison of labor costs in today's terms, and to eliminate the effect of inflation and general wage increases, 1973 salaries were converted to their 1986 equivalents. In order to eliminate variation caused by staff turnover, the mean annual salary for administrative librarians or general librarians was used for each professional position, and a mean annual salary derived from the salary range for each classification was used for support staff positions. The total labor costs for the cataloguing divisions were calculated for both years and are given in Table 7. The net change in staff levels in each classification was determined from Table 2, and the change in labor costs calculated. The result is shown in Table 8. Changes in the number of staff resulting from automation were determined, and the change in labor costs attributable to these was calculated and has been included in Table 6. The cost of automation-related reclassification was identified, and is included in Tables 5.3 and 5.4. The proportion of total labor cost changes due to automation-related staffing changes was also determined, and is given in Table 6.

For an accurate comparison of 1973 and 1986 production statistics, certain adjustments have to be made to account for changes in hours actually worked. During the past thirteen years, collective bargaining has led to increased staff vacation time and sick leave, more statutory holidays, and a shorter work week. Staff in 1973 worked more hours per year than staff in 1986. Table 9 adjusts the figures for 1973 by giving the number of staff that would have been required in 1973 if staff had been working the same number of hours per year as staff do in 1986.

Production statistics were obtained from the records maintained by the cataloguing divisions. Categories used were number of titles of original cataloguing, number of titles of derivative cataloguing, number of titles of serials catalogu-

ing, number of titles of nonbook cataloguing, number of reclassifications (it was not possible to determine what proportion of serials, nonbook materials, or reclassifications were processed through original as opposed to derivative cataloguing), added copies processed, added volumes processed, titles searched, cardsets produced, cards filed, and items processed. To reduce the effect on productivity of time lost due to staff training, mean production figures were determined based on the years preceding the year in question as well as the year itself. These averages were then used to determine changes in production which had occurred between 1973 and 1986. Production statistics and changes are given in Table 10.

It was not possible to isolate completely the effect on production of automation-related changes from changes brought about by other factors such as reorganization; hence production and productivity changes can only be discussed in global terms, although an attempt has been made to identify the effect of automation. Using the adjusted staff figures from Table 9 and selected production categories from Table 10, a comparison was made of cataloguing production per staff member for 1973 and 1986, and the changes determined. The results are shown in Table 11. A further analysis of labor costs and productivity was carried out for certain key production categories. The total labor costs for the cataloguing divisions in each year obtained from Table 7 were divided by the number of units produced in each selected category for that year obtained from Table 10. The dollar ratios calculated were compared and are shown in Table 12.

Analysis and Discussion

It is clear from Table 1 that the Library has undergone a substantial reduction in staff numbers between 1973 and 1986. Overall during this period, there was a net loss to the Library of 25.7 positions, or 6% of its staff. If actual hours worked are considered, the situation was even worse. The Library lost 14% of

available working hours. Moreover, 1986 staff figures include positions added for new responsibilities, such as services related to the medical expansion program, the opening of new branch libraries at the teaching hospitals, and the operation of the Film Library. Reductions in staff which affected units in existence in 1973 were thus more severe than Table 1 indicates.

There has been a greater reduction in non-student support staff than professional staff in terms of both numbers and hours worked. While the number of librarians actually increased by 6 positions, or 6%, the number of support staff decreased by 32.7 positions, or 11%. The net increase in the number of librarians, which is mainly accounted for by the new services mentioned above, offset the reduction in professional hours worked to some degree, holding it to 3%, while the available support staff working hours declined by 20%.

The reduction in Technical Services staffing has been substantially more than the Library average. There has been a decrease of 19% in positions, and a decrease of 27% in available staff working hours during the past thirteen years. In fact, if the Administration is ignored, (and the large change there is mainly attributable to a redistribution of student assistant hours to other areas) Technical Services has lost more positions and working hours than any other area. The reduction in staffing within the cataloguing divisions has been even greater. Between 1973 and 1986, Table 2 shows that there was a net reduction of 30.5 positions, a decrease of 28%. In terms of hours worked, the decrease from 1973 to 1986 is 35% (see Table 9).

The results of financial retrenchment, reorganization, and technological change have been most pronounced in Technical Services in general and the cataloguing divisions in particular. Why should this be? After all, these factors must have affected other functional areas as well. The reason lies in the nature of the card catalogue. To produce and maintain a catalogue in card form requires a large

number of junior clerical staff who type stencils or paste up masters, sort finished cards, type headings on individual cards, and then file those cards. In addition, a manual cataloguing system presupposes the maintenance of working files in card form, such as an authority file and a shelflist, as well as card files of source data for cataloguing, such as LC printed cards, also requiring junior clerical staff. While more senior support staff are less involved in the actual performance of this work, they are required to supervise and train units of junior staff, and are responsible for filing revision and error detection and correction.

The implementation of an automated cataloguing system does away wit considerable amount of this work, as either a computer-output microfiche ca logue or an online catalogue replaces the card catalogue, thus releasing a lar number of support staff positions for redeployment or elimination. This savin may be offset to some extent by the need to upgrade certain positions where duti have become more complex because of new technologies, but the net result should be an overall reduction in the number of junior staff. An examination of the reductions in specific classifications in Table 2 supports this view. Student assistants and Library Assistants 1, who did most of the filing, have been reduced by 68% and 60% respectively. Library Assistants 2, who performed the bulk of the card typing duties, have been reduced by 46%.

One effect of this has been a change in the pattern of staffing: that is, in the proportion of the total cataloguing staff contributed by each classification. As shown in Table 3, librarians and senior library assistants now form a larger proportion of the staff than they did in 1973, and student assistants and junior library assistants form a smaller proportion. As well, the ratio of librarians to support staff has increased. It is clear from Table 4 that, in cataloguing at least, this increase is not due to an increase in the number of librarians, but to a large decrease in the number of support staff. While at first glance this seems to disagree with

Molyneux's observation of a decline in the ratio of librarians to support staff in ARL libraries, it may provide a partial explanation for the stabilization in the ratio or possible increase in the ratio which he feels may have already begun.[77]

It is appropriate at this point to examine more closely the reasons for the changes in staffing which have been discussed so far. During the past thirteen years, three major influences have been at work which have affected developments within cataloguing and, indeed, within the Library as a whole. The first has already been mentioned earlier: this was the inability to maintain the card catalogue as it continued to grow and require more space, as well as more staff resources for its upkeep. The second was the continuing pressure to make financial economies, especially in staff salaries and wages. The third was the desire on the part of the Library administration and the professional staff to improve the level and quality of Library services to users.

These influences have led to the reorganization of the cataloguing divisions and the implementation of automated systems in a continuing effort to operate efficiently, as well as effectively. As a result of reorganization or retrenchment, Table 5.1 shows that 8.5 positions were eliminated from cataloguing, including those of two administrative librarians and 1.5 general librarians. Six of these positions, including three professional positions, were reassigned to other Library divisions. As well, during the period prior to automation, four Library Assistant 3 positions were upgraded to Library Assistant 4 for reasons related to working with specialized language or subject materials. Through reassignment of responsibilities, or to resolve personnel problems, 4.2 positions were added to the cataloguing establishment by transfer from other Library divisions.

The implementation of automation has had a much wider effect. Table 5.1 shows that 26.1 positions were eliminated from cataloguing for automation-related

[77]Molyneux, "Staffing Patterns," p. 296.

reasons. Although only one professional position was deleted, six senior library assistants and 19.1 junior clerical staff and student assistant positions were removed. Of these positions, only four were reassigned to other divisions. The others were used to meet quotas for staff economies imposed by the University, or to provide funding for utility charges, or for the hardware and software costs of the automated systems developed in-house. Automation accounted for 75% of the positions actually eliminated from the divisions. Two positions, including one administrative librarian position, were downgraded as duties changed. Table 5.4 shows that eight positions were upgraded for reasons related to automation, accounting for 67% of all of the positions upgraded during the entire thirteen-year period. Two Library Assistants 2 were reclassified to Library Assistant 3, three Library Assistants 3 were reclassified to Library Assistant 4, and two Library Assistant 4 positions were converted to professional positions. These downgraded and upgraded positions are discussed in further detail below.

Table 6 summarizes the changes in cataloguing staff due to automation and to other reasons. Automation has accounted for 86% of the net reduction in positions, and has clearly been the most significant factor which has affected the number of support staff in the cataloguing divisions, especially the number of junior clerical staff. Automation has not led to substantial reductions in the number of librarians, however. Conversely, through upgrading, two additional professional positions have been established as a result of automation. It is reorganization and retrenchment which have played the leading role in reducing the number of librarians in cataloguing.

A comparison of the job descriptions of librarians for 1973 and 1986 reveals changes in responsibilities and duties brought about by the effects of both reorganization and automation. Reorganization of the cataloguing divisions increased the administrative responsibilities of the current division heads, as one level in the or-

ganizational hierarchy was abolished. The elimination of a separate original cataloguer for Law has led to the reassignment of Law cataloguing to the original cataloguer responsible for Indic language material. The dissolution of the LC Cataloguing Division and the transfer of derivative cataloguers to the new Catalogue Records Division led to the establishment of specialized language and subject units. Each unit is headed by a librarian, the original cataloguer responsible for that language or subject area, and consists mainly of Library Assistants 4 (Senior Derivative Cataloguers) and Library Assistants 3 (Derivative Cataloguers/Searchers). The original cataloguers are now responsible for work planning, work assignment, staff training, performance evaluation, time keeping, and personnel selection in addition to their normal cataloguing duties. Reorganization has had a major impact on the managerial and supervisory responsibilities of librarians.

The effect of automation on qualifications and job duties has also been substantial. The job description for the position of Head, Catalogue Records Division, requires a familiarity with automated cataloguing systems, and places particular emphasis on keeping up with new technologies. The responsibilities of the position include retrospective conversion of records, and the application of computer methods to the format and structure of cataloguing. The Head of the Catalogue Products Division is now responsible for supervising the input of data for various automated systems, and for the distribution of COM catalogues. For all professional cataloguing positions, required qualifications now include familiarity with automated cataloguing systems and knowledge of and experience with MARC coding, as well as familiarity with the LC classification system and AACR 2.

In 1973, original cataloguers worked with a photocopied title page as a worksheet. Once completed, this worksheet was sent to typists for stencil typing and reproduction. Headings were checked in a card authority file, and classification numbers in a card shelflist. Librarians were responsible for stencil check-

ing to catch typing and cataloguing errors, and for ensuring that these were corrected by the typists. Once cards were completed and filed, librarians (as well as senior library assistants) were responsible for filing revision. In addition, original cataloguers provided classification numbers and subject headings to derivative cataloguers for those areas where the Library used different numbers or headings than LC, or when source data was incorrect. The latter did not occur very frequently as the bulk of the source data used came from LC cards in the depository control files maintained for the use of derivative cataloguers.

Today, original cataloguers are required to enter full or brief cataloguing records into the Library's computer-based catalogue, including authority records for names and subjects. They must supply full MARC coding for the input of all original cataloguing, and are responsible for assisting staff in their units with coding problems. They proofread the data entry of original cataloguing, checking for errors in transcription, coding, and cataloguing. They also proofread the data entry of all derivative cataloguing. They are responsible for the online correction of errors, or for delegating error correction to other staff. They must be able to use terminals, access local automated systems, and be conversant with the use of different online utilities. As well, they have continued to be responsible for assigning classification numbers and subject headings for derivative cataloguing when source data is incomplete or incorrect, and for those areas where the Library does not follow standard LC practice.

Source data now comes from many different institutions and varies in quality. Considerably more time and effort is required to modify this data and to ensure that it meets acceptable standards. Headings may follow ALA or AACR 1 practices and must be converted to meet the requirements of AACR 2. Derivative cataloguers require more frequent assistance today from original cataloguers in resolving classification and heading difficulties, as well as considerable assistance

with MARC coding problems. It is important to note at this point that the UBC Library considers any cataloguing which makes use of source data as derivative cataloguing for statistical purposes, no matter how much involvement there may have been from an original cataloguer in changing classification numbers, headings, coding, or descriptive cataloguing. The Head of the Catalogue Records Division estimates that, today, original cataloguers spend only 15% of their time performing pure original cataloguing.[78]

The MARC format is used to create and maintain bibliographic records in the UBC Library. As mentioned above, the MARC format is complex and is not particularly user-friendly. Not only must original cataloguers assist derivative cataloguers with coding problems, they must use MARC coding themselves in their own work. As well, in proofreading the work of other original cataloguers and derivative cataloguers, they must now check for MARC coding errors, in addition to keying and cataloguing errors. It seems likely that these increases in the work of original cataloguers brought about by the requirements of automated systems may explain in part the decline in the production of original cataloguing discussed below.

Two new professional positions were created in the Catalogue Products Division by converting two Library Assistant 4 positions. Subject authority control and the maintenance of the automated cross-reference system were felt to warrant the direct involvement of a librarian in one case. In the other, a librarian was required to supervise the processing of added copies and volumes. The justification for this change stated that a librarian was required to provide technical and bibliographic expertise not available at the Library Assistant 4 level, and that the training of staff in complex adding procedures using an automated cataloguing system went beyond what could be expected from a Library Assistant 4. It pointed out

[78]Ann Turner, Head, Catalogue Records Division, interviewed in November, 1986.

that problems could only be resolved by a librarian familiar with the principles of bibliographic control and the intricacies of the cataloguing system.

It is clear that automation has had a pervasive and substantial effect on the duties and responsibilities of librarians in the cataloguing divisions. Librarians have had to learn a new set of skills and have had to become familiar with new technologies. In addition, automation has meant additional supervisory duties in the form of closer involvement in the work of derivative cataloguers. This, coupled with changes in reporting relationships brought about through reorganization, has meant a substantial increase in the supervisory and managerial responsibilities of individual librarians. The continuing key role of librarians in the cataloguing process may explain why automation has had relatively little effect on the number of librarians in the cataloguing divisions.

A comparison of support staff job descriptions for the two years also reveals major changes. As Tables 5.1, 5.4, and 6 indicate, the most significant cause of change has been the introduction of automation. In 1973 five job descriptions covered the duties of 15 Library Assistants 1 who formed 14% of the cataloguing staff. In 1986, two job descriptions covered six positions, and Library Assistants 1 formed only 8% of the cataloguing staff. The closing of the card catalogue and a massive reduction (88% between 1973 and 1986) in the volume of card sorting and filing, as well as the cessation of in-house card production, eliminated entire jobs. Positions which were responsible for such duties as rough and fine card sorting, filing, matching stencils with cards, card production using a photocopier, and distribution of finished card sets, ceased to exist.

Those Library Assistant 1 positions which remain have been only incidentally affected by automation. Book preparation positions declined from 10 to 5 as filing and sorting duties were removed, but up to now automation has had little effect on marking routines. The only Library Assistant 1 left in the Catalogue

Records Division is responsible for checking the printers daily and replenishing paper and changing ribbons, but that is the extent of automation-related duties.

The closing of the card catalogue also had a substantial effect on the numbers and duties of Library Assistants 2 and Keypunch Operators. In 1973, this group included 27 positions and formed 24% of the cataloguing staff. By 1986, the same group, now only including Library Assistant 2 positions, included 12.9 positions and formed 16% of the cataloguing staff. Catalogue Typists, who were responsible for typing card masters or stencils and for typing headings on finished cards as well as sorting and filing cards, were reduced from 16 to 5 positions and renamed Data Entry Assistants. They now use terminals to enter original cataloguing records, produce book cards, enter authority records, and enter information for the circulation system. They are still responsible for typing some card masters for non-roman alphabet materials, and for completing the card sets produced.

Keypunch Operators, who had been responsible for keypunching book cards, were downgraded to Library Assistant 2 and included with the Data Entry Operators. With the replacement of keypunch machines by terminals and the involvement of Library Assistants 2 in data entry duties, the rationale for the continued use of the Keypunch Operator classification within the Library ceased to exist. The downgrading was accomplished by means of a lumpsum payment to the remaining Keypunch Operators (including those in other Technical Services divisions) and had the benefit of providing them with greater opportunities for promotion within the Library Assistant occupational group.

Three Library Assistant 2 positions were upgraded as a result of automation. Data Entry Assistants for Indic and Slavic language materials were reclassified to Library Assistant 3 because of the complexity of romanizing non-roman alphabet material in a variety of languages, and then entering the romanized version online using a system of diacritical marks. Another position was reclassified to Library

Assistant 3 when assigned added volumes duties which involved online editing and modification of records.

Other Library Assistant 2 positions had their duties changed as well. Pre-cataloguing searching is done online where possible, rather than manually. Bibliographic records are edited online from prepared worksheets or order forms. Added copies assistants update monograph holdings information online. They no longer need to have card sets made for new locations. The catalogue maintenance assistant uses a terminal to enter cross-reference information. Photographs of NUC entries are no longer used to produce card masters for duplication.

In contrast with Library Assistant 1 positions, those Library Assistant 2 positions which have remained after the implementation of automation have been substantially affected by it. But the large reduction in the number of Library Assistants 2 parallels the reduction in the number of Library Assistants 1. The group of junior support staff, consisting of student assistants, Library Assistants 1 and 2, and Keypunch Operators, was reduced from 44.1 positions, or 41% of the cataloguing staff in 1973, to 19.9 positions, or 25% of the cataloguing staff in 1986. Most of this 55% reduction in junior staff can be attributed to the effects of automation, and is indicative of how automation in cataloguing has affected routine clerical work.

From Tables 2, 3, 5.1, and 5.4 it is apparent that the number of Library Assistant 3 positions has decreased much less than that of more junior positions. Indeed, upgrading for both automation-related and other reasons has had a much more significant effect on the number of Library Assistants 3 than the elimination of positions. Prior to reorganization and automation, three Library Assistant 3 positions - the Chinese Language, Japanese Language, and Medical Cataloguing Assistants - were reclassified to Library Assistant 4. Justifications for these reclassifications were based on specialized language or subject skills required, the diffi-

culty of the material dealt with, and (in the case of the Medical Cataloguing Assistant) the added complication caused by the UBC Library's decision to use the NLM classification and subject headings rather than those used by LC. In addition, the position of Book Preparation Supervisor was upgraded to Library Assistant 4 subsequent to the introduction of automation. The justification for this request (which was not initiated by the Library) was based on supervisory responsibility and on a comparison with the classification of the Data Preparations Supervisor, and was not the result of automation.

Three positions were reclassified for reasons related to automation. The position of Card Preparation Supervisor, which included the responsibility of training and supervising the catalogue typists in the typing of stencils and the completing of card sets, was retitled Data Preparation Supervisor and upgraded to Library Assistant 4 upon involvement with automated systems. Responsibilities now include the supervision of the input of records into the cataloguing database, the online editing and correcting of records, the production of book cards, the input of data into the circulation system, and the training and supervising of data entry staff in non-roman alphabet card production. Another Library Assistant 3 position was upgraded to Library Assistant 4 to establish the position of Oriental Languages Cataloguing Assistant. The duties of this position include the full MARC coding of bibliographic and holdings records produced by the Chinese and Japanese Language Cataloguing Units, assisting in the training of other staff in coding, as well as online editing for derivative cataloguing. The final automation-related upgrading of a Library Assistant 3 to Library Assistant 4 established an additional Senior Derivative Cataloguer, whose duties include the creation of machine-readable records from print source data which requires full MARC coding, assisting other staff with coding problems, derivative cataloguing including online editing, and simple original cataloguing, mainly of literary works.

In 1973, there were 17 LC Cataloguers/Searchers and Bibliographic Searching Assistants who used LC or other shared cataloguing copy to catalogue books, typed up a five-part form from which typists would produce card masters, searched book orders and carried out pre-cataloguing searching in manual files, filed cards, and revised filing. In 1986 their responsibilities are carried out by 12 Derivative Cataloguers/Searchers who use terminals to edit source cataloguing copy online, create records in the cataloguing database, carry out pre-cataloguing searching in online databases, including those of utilities, proofread cataloguing, correct errors, and search book orders. Even the Calligrapher, who is still responsible for handlettering Chinese and Japanese characters on card masters for original cataloguing, now catalogues Western language materials for the Asian Library online. Six Added Copies/Volumes Assistants update holdings information online, convert bibliographic holdings information into machine-readable form for monographic materials, search online databases for cataloguing information, and edit records online, instead of updating holdings information in card files and requesting additional catalogue cards for branch catalogues.

Similar changes have occurred in the duties of other Library Assistants 3. Only one job description was completely eliminated. The Head Filer was responsible for the training of all filers for the public and working files, filing revision, and for assisting with the establishment of new subject headings for the subject catalogue. These duties became redundant with the closing of the catalogues, and the position and incumbent were reassigned to added copies/volumes duties.

The reduction in the actual number of Library Assistants 3 has been less than the reduction in the number of junior support staff, and proportionately there has been an increase. While 27 Library Assistants 3 formed 24% of the cataloguing staff in 1973, today 22.5 form 29% of the total staff. However, this classification has been significantly affected by automation-related and other upgrading, al-

though losses to higher classifications for automation-related reasons have been balanced by gains from lower classifications. It is clear from an examination of changes in job duties that the effect of automation has been substantial.

Table 2 shows a net increase of 10% in the number of Library Assistants 4 between 1973 and 1986. This somewhat sanguine impression is dispelled by an examination of Tables 5.1 and 5.4. Four Library Assistant 4 positions were eliminated, and two were converted to professional positions for reasons related to automation. Over 35% of the Library Assistant 4 positions which existed in 1973 have thus disappeared. These losses have been offset by seven reclassified Library Assistant 3 positions, and by the transfer of a .75 FTE position from another division.

A comparison of Library Assistant 4 job descriptions for 1973 and 1986 indicates that significant automation-related changes in duties have occurred. In 1973 there were eight Revisers whose responsibilities included filing revision, error correction, and the supervision of branch catalogues. Today there are only two. Their duties include online correction of errors, the editing of input for coding and keying errors, and assisting with subject authority work. They must be familiar with MARC coding. It is clear that the reduction in the number of Revisers and the changes in their duties are directly related to the implementation of automated cataloguing, the closing of the card catalogue, and its replacement by a COM catalogue.

For Library Assistants 4 in subject and language units, manual methods of cataloguing have been replaced. They are now responsible for creating records for input to the cataloguing database from derivative copy in print form, including full MARC coding, for derivative cataloguing using and editing online data, for online pre-order and pre-cataloguing searching using local and remote databases, for authority work including the revision of headings to AACR 2 form, for proof-

reading of editing and cataloguing, and for assisting other staff with coding problems. They continue to be responsible for some elementary original cataloguing under supervision, and for assisting original cataloguers with the training of other staff.

In addition, through the upgrading of a Library Assistant 3 and the reassignment of two Revisers, three Senior Derivative Cataloguer positions were established to perform duties similar to those of the subject and language specialists, but for more general materials. At the time of the implementation of automation, it was decided that derivative cataloguing using print source data (which requires the creation of new machine-readable records as well as full MARC coding) went beyond what could be required of Derivative Cataloguers/Searchers classified as Library Assistant 3.

As discussed earlier, two Library Assistant 4 positions were converted to professional positions. The position of Catalogue Maintenance Supervisor, with responsibility for the general maintenance of the public catalogues and the establishment of subject headings, became partially redundant with the closing of the catalogue, and subject authority work in an automated system was considered to warrant the attention of a librarian. The rationale for the conversion of the position of Added Copies Supervisor has already been mentioned in the review of professional job descriptions.

In 1973, nine job descriptions covered 17 Library Assistant 4 positions which formed 16% of the cataloguing staff. In 1986, sixteen job descriptions cover 18.8 positions which form 24% of the total staff. Clearly, Library Assistant 4 positions have become more specialized. Despite reductions made through automation, substantial reclassification of more junior positions for automation-related as well as other reasons has resulted in an increase in the number of Library Assistants 4.

An examination of the two Library Assistant 5 job descriptions reveals few overt changes. Responsibilities are mainly managerial and supervisory and are stated in general terms. There has been no change in the number of positions in this classification. Of the two positions, one is responsible for the general organization of bibliographic searching related to book ordering, and the other is responsible for the general organization of derivative cataloguing. Both job descriptions include work distribution and training responsibilities.

The Administrative Assistant for Derivative Cataloguing is responsible for training library assistants and new librarians in derivative cataloguing routines. Duties also include the proofreading of derivative cataloguing, and the processing of difficult materials. As well, this position is responsible for handling day-to-day problems with bibliographic utilities. All of these presuppose complete familiarity with the automated catalogue, MARC coding, and the utilities currently used. The Administrative Assistant for Bibliographic Searching is responsible for training Library Assistants 3 and 4 in pre-order searching, including the use of online databases. Again, the area of responsibility now requires complete familiarity with local and remote systems.

Changes brought about by automation and the use of new technologies have affected the standard job descriptions, or grade definitions for the various classifications in the Library Assistant occupational group. At all levels, qualifications now include a requirement to operate data entry systems. This ability is now considered a basic qualification for all classifications of Library Assistant, and is no longer associated with a specialized classification such as Keypunch Operator. Typical job duties listed as examples for the Library Assistant 2 classification include assisting with the maintenance of the microcatalogue, converting holdings into machine-readable form, and editing machine-readable records. References to sorting and filing cards and typing cards have been removed. The typical job du-

ties for the Library Assistant 4 classification include the responsibility for full MARC coding of bibliographic and holdings records. Filing revision is no longer listed. Clearly the changes which have occurred in individual job descriptions have influenced the standards for the classifications when those standards were rewritten and renegotiated.

The total labor cost of the cataloguing divisions in 1973 stated in terms of 1986 salaries was $2,401,511. In 1986, the cataloguing labor cost was only $1,801,696, a net reduction of $599,660 or 25% in terms of today's costs. What portion of this can be attributed to the use of automated systems? Table 6 indicates that $ 461,918 or 77% of this net saving was related to the implementation of automation in the cataloguing divisions. Table 5.1 shows that automation accounted for 68% of the salary costs of eliminated positions.

After the discussion of the amount of upgrading that took place as a result of automation, it comes as no surprise that the cost for this accounted for 77% of the total cost of upgrading during the thirteen year period. The conversion of two Library Assistant 4 positions to professional positions was responsible for the majority of this cost increase. However, all of the savings resulting from the downgrading of positions were the effect of automation.

Table 6 shows that the mean net saving per position eliminated for all reasons was $19,726. For automation-related change, this saving was $17,698, while for non-automation-related change, it was $32,033. This difference is explained by the fact that automation has resulted in substantial reductions in the junior clerical staff whose salaries are relatively low, while other changes, such as reorganization, have had a greater effect on higher-salaried professional staff. Nevertheless, the effect of automation has been a net reduction in 1973 cataloguing labor costs of 19% or $461,918 stated in terms of 1986 salaries.

In most instances, it was not possible to isolate the effect that automation has had on production and productivity from the effect of other change, most notably from that of reorganization. One can assume that in some cases, efficiencies brought about by automation may have offset additional responsibilities brought about by reorganization and hence there has been little or no effect on production and productivity. In other cases, there may have been a multiplier effect, as new complexities introduced by automated systems compounded the effects of additional duties added through reorganization, and thus production and productivity may have declined.

Table 10 shows that the number of cards filed and the number of card sets produced decreased by 88% and 94% respectively between 1973 and 1986. Clearly this is a direct result of the change to an automated catalogue and correlates with the substantial decline in the number of junior support staff who were responsible for this work. While the number of items processed has also declined, Table 11 indicates that per capita productivity for the remaining Library Assistants 1 has increased by 111%. The removal of card filing and sorting duties, another result of automation, has meant that each individual can now process more books than in the past.

An increase of 18% in the number of titles catalogued by derivative cataloguers can also be attributed to the use of automated systems which permit access to substantially more source data sooner. Per capita production for Library Assistants 3 and 4 has increased by 40%, even though Table 9 shows a combined 26% decrease in the number of staff in these classifications. The efficiencies of the automated cataloguing system coupled with the removal of filing and filing revision duties means that substantially fewer staff in these classifications can process more materials.

Table 10 indicates that the number of titles catalogued by original cataloguers has declined by 55%. The increase in derivative cataloguing does not account for this, nor does the 21% decrease in the number of librarians shown in Table 9, for, as Table 11 indicates, actual per capita production for original cataloguers has declined by 43%. Nor is this due to the lack of material requiring original cataloguing, for a substantial backlog still exists. Each original cataloguer is simply cataloguing fewer books in 1986 than in 1973.

The review of the literature has already suggested several reasons for this, as has the examination of changes in job duties and responsibilities. The managerial and supervisory responsibilities of original cataloguers have been increased through reorganization, and each librarian is now supervising more support staff than in the past. This involves more time spent in training, planning, work assignment, and personnel administration. In addition, automation has changed the nature of the working relationship between original and derivative cataloguers. Original cataloguers now spend substantial amounts of their time providing classification numbers and subject headings for incomplete or unacceptable source data used by derivative cataloguers. As well, they assist derivative cataloguers with coding problems, and with the establishment of correct headings for names, uniform titles, subjects and series. This authority work is especially time-consuming, as source data may include headings following ALA or AACR 1 conventions which must be converted to AACR 2 form. It must be done, however, to avoid filing errors in the catalogue database which would lead to separate filing sequences of headings. Unfortunately, cataloguing statistics do not record the number of derivatively catalogued titles which have required the assistance of an original cataloguer.

Original cataloguing itself has also become more complicated. As mentioned earlier, the material now left to the original cataloguers is the more complex and

difficult, and hence requires more time and effort to process. Records are now created and entered online, and require full MARC coding, processes which consume considerably more time than the previous practice of marking up a photocopy of the title page. Greater care is taken in checking name and subject headings online and in microfiche authority files, and all call numbers assigned must be checked in the card shelflist as well as online to avoid possible conflicts. The factor of morale may also have affected productivity. External standards have replaced professional judgment to some extent, and librarians have had to learn 'clerical' computer-related skills such as keying and the use of terminals. Sometimes, too, the material left for original cataloguing, while difficult, may also be less interesting and less rewarding.

Because of the involvement of original cataloguers in derivative cataloguing, Table 11 provides a comparison of all titles catalogued by the consolidated group consisting of librarians, Library Assistants 4, and Library Assistants 3. Per capita production increased by 109 titles, or 11% between 1973 and 1986. This measure gives a more balanced indication of the change in the productivity of all cataloguers during the past thirteen years.

Some explanation should be provided for the categories listed on Tables 10 and 11 which have not been discussed so far. Nonbook cataloguing has increased as nonbook materials have increased in proportion to other materials in the collection. There has been almost no change in the number of serials catalogued, nor has there been any change in the number of staff responsible for cataloguing serials. Reclassifications have declined by 81% because of a cost-saving decision to limit the amount of reclassification. The number of added copies processed has decreased as the Library has reduced the number of multiple copies ordered. Added volumes processing has declined as serials subscriptions have been reduced, and as the purchase of monographic sets has been curtailed, although per capita

production of staff assigned to this work has increased by 10%. The number of titles searched has declined as the purchasing power of the book budget has shrunk, although the per capita production of searchers has remained nearly constant.

A final comparison combines both production statistics and labor costs. Table 12 provides dollar cost ratios obtained by dividing the total labor cost for the cataloguing divisions by the total units produced in each category. While the cost ratio for original cataloguing increased by 66%, the cost ratio for derivative cataloguing decreased by 36%. For the group of all titles catalogued, however, there was a reduction of 18% in the cost ratio between 1973 and 1986. The changes in these cost ratios correlate with the changes in per capita production already discussed.

Conclusions

It is now possible to answer the questions developed earlier about the effect of automation on the staff, labor costs, and production of the cataloguing divisions of the UBC Library. There has been a change in the number of librarians because of automation. However, the one position eliminated was outweighed by the two professional positions created through conversion from support staff positions. Moreover, the effect of automation has been overshadowed by reductions brought about by earlier reorganization of the cataloguing divisions. The fact that this reorganization had already occurred, and that it had led to a more efficient operation may account for the inability to make further economies in professional staff. The net effect of automation has been to increase the number of librarians in the cataloguing divisions of the UBC Library, which contradicts the experience of other institutions.

There has been a substantial decrease in the number of support staff which can be attributed to automation. This has varied from classification to classification, with the most junior classifications being hardest hit, as automation did away with clerical routines related to card sorting and filing, and the production and typing of catalogue cards. The more senior classifications have lost fewer positions, and reclassification has tended to offset some of the losses. There has been no increase in support staff because of automation.

The ratio of librarians to support staff has increased by 22%. Although not all of this change can be attributed to automation, most of it is due to the reduction in support staff brought about by automation. Librarians now form 20% of the cataloguing staff as opposed to 16% in 1973.

The duties and responsibilities of librarians have been changed substantially through the implementation of automation. Librarians have had to become famil-

iar with the computer and online systems. Supervisory and managerial responsibilities have been affected to a greater degree by reorganization, but automation has changed the working relationship between librarians and their support staff, involving the librarians more closely in the work of derivative cataloguers.

Support staff duties have also been radically changed through the use of automated systems. At the more junior levels, duties were made redundant by new technology, and positions have been eliminated. For more senior positions, new machine-related skills have had to be learned. For a substantial number of positions, an increase in the complexity of work brought about by the use of automated systems has led to reclassification to higher levels.

Automation has had a substantial effect on labor costs. Using cost figures based on 1986 salaries, automation accounted for 77% of the net reduction in salary expense between 1973 and 1986, and reduced the 1973 cataloguing salary cost by 19%. The current value of such a reduction in labor costs should be kept in mind when looking at the operating costs of an in-house automated catalogue, or the charges levied by utilities.

Finally, automation has affected production and productivity, although it has not been possible to isolate its effects completely. It appears that the increase in derivative cataloguing production and per capita productivity has been the result of the use of automated systems. Certainly the massive reductions in the number of cards filed and card sets produced are an obvious result of the move to an automated catalogue. Although an explanation has been given for the substantial reduction in the production and productivity of original cataloguers, more research is required to elucidate the role that automation has played here. This will at the very least require the collection of more discriminating statistics to determine exactly how original cataloguers spend their time, and in particular, to de-

termine the extent to which their work influences derivative cataloguing production.

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Figure
1

Organization Diagram 1973

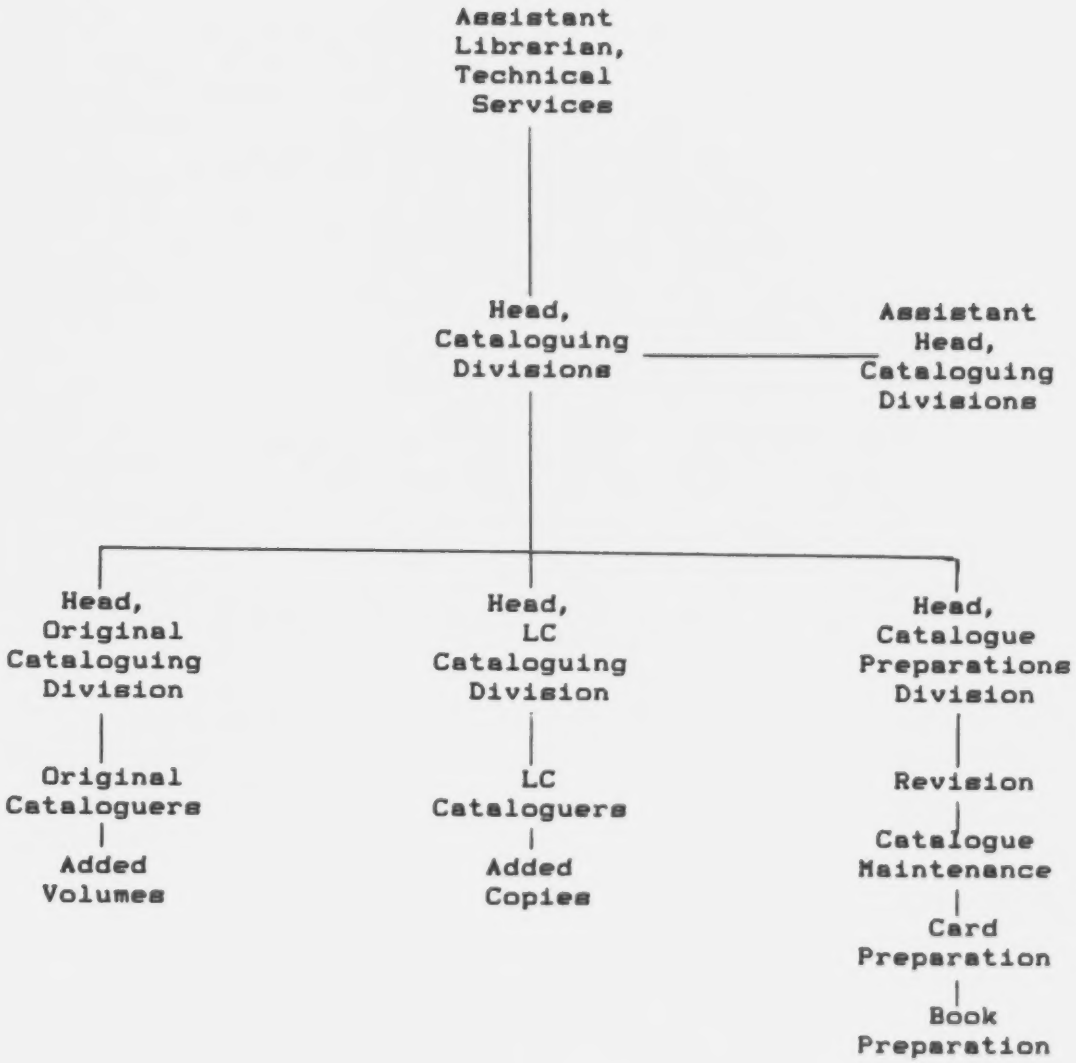

Figure 2

Organization Diagram 1986

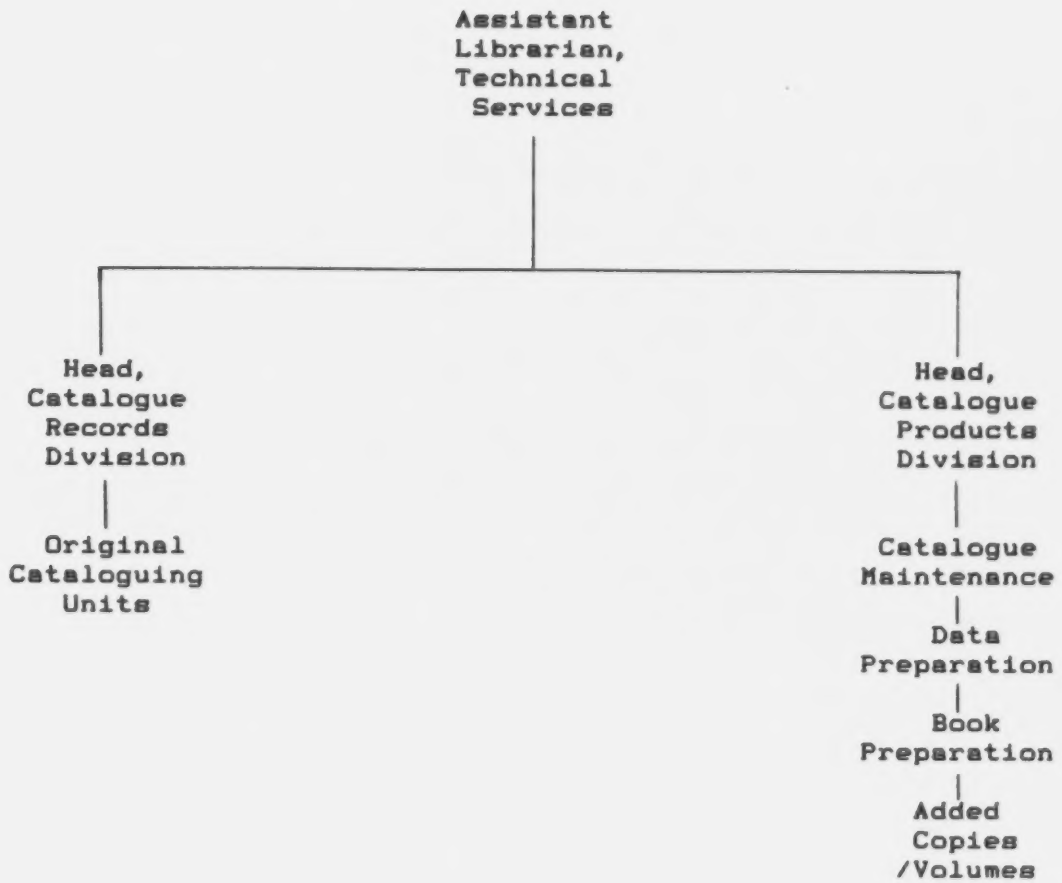

Table 1

Library Staff Comparison 1973 and 1986

Number of Staff

Classif.	Year	Admin.	Coll.	Public Services	Technical Services	Total	Incr. (Decr.)	Change (%)
Librarians	1973	7.0	7.5	63.0	20.0	97.5		
Librarians	1986	6.5	5.0	68.9	23.1	103.5	6.0	6%
Supp. Staff	1973	5.0	3.0	163.0	133.0	304.0		
Supp. Staff	1986	7.0	4.0	160.1	100.2	271.3	(32.7)	-11%
Stud. Asst.	1973	8.0	0.0	35.5	3.1	46.6		
Stud. Asst.	1986	1.5	0.4	42.3	3.4	47.6	1.0	2%
Total Staff	1973	20.0	10.5	261.5	156.1	448.1		
Total Staff	1986	15.0	9.4	271.4	126.7	422.4	(25.7)	-6%
Incr.(Decr.)		(5.1)	(1.1)	9.9	(29.4)	(25.7)		
Change (%)		-25%	-10%	4%	-19%	-6%		

Hours Worked

Classif.	Year	Admin.	Coll.	Public Services	Technical Services	Total	Incr. (Decr.)	Change (%)
Librarians	1973	11,970	12,825	107,730	34,200	166,725		
Librarians	1986	10,137	7,798	107,456	36,027	161,418	(5,307)	-3%
Supp. Staff	1973	8,812	5,288	287,288	234,413	535,801		
Supp. Staff	1986	11,083	6,333	253,534	158,609	429,559	(106,242)	-20%
Stud. Asst.	1973	14,651	0	64,740	5,646	85,037		
Stud. Asst.	1986	2,645	743	77,213	6,209	86,810	1,773	2%
Total Staff	1973	35,433	18,113	459,758	274,259	787,563		
Total Staff	1986	23,865	14,874	438,203	200,845	677,787	(109,776)	-14%
Incr.(Decr.)		(11,568)	(3,239)	(21,555)	(73,414)	(109,776)		
Change (%)		-33%	-18%	-5%	-27%	-14%		

Table 2

Number of Cataloguing Staff

Classification	1973	1986	Increase (Decrease)	Change (%)
Administrative Librarian	5.0	2.0	(3.0)	-60%
Librarian	13.0	13.5	0.5	4%
Subtotal	18.0	15.5	(2.5)	-14%
Library Assistant 5	2.0	2.0	0.0	0%
Library Assistant 4	17.0	18.8	1.8	10%
Library Assistant 3	27.0	22.5	(4.5)	-17%
Library Assistant 2	24.0	12.9	(11.1)	-46%
Library Assistant 1	15.0	6.0	(9.0)	-60%
Keypunch Operator	2.0	0.0	(2.0)	-100%
Secretary 2	1.0	0.0	(1.0)	-100%
Subtotal	88.0	62.2	(25.9)	-29%
Student Assistant (FTE)	3.1	1.0	(2.1)	-68%
Total Staff	109.1	78.6	(30.5)	-28%

1986 figures include Reading Room transfers less time actually spent on Reading Room duties.
1973 figures do not include three Library Assistant 2 positions transferred to the Serials Division along with their duties.

Table 3

Proportion of Cataloguing Staff in Each Classification

Classification	1973 No. of Staff	1973 Prop. of Total	1986 No. of Staff	1986 Prop. of Total
Administrative Librarian	5.0	5%	2.0	3%
Librarian	13.0	12%	13.5	17%
Subtotal	18.0	16%	15.5	20%
Library Assistant 5	2.0	2%	2.0	3%
Library Assistant 4	17.0	16%	18.8	24%
Library Assistant 3	27.0	25%	22.5	29%
Library Assistant 2	24.0	22%	12.9	16%
Library Assistant 1	15.0	14%	6.0	8%
Keypunch Operator	2.0	2%	0.0	0%
Secretary 2	1.0	1%	0.0	0%
Subtotal	88.0	81%	62.2	79%
Student Assistant (FTE)	3.1	3%	1.0	1%
Total Staff	109.1	100%	78.6	100%

Table 4

Ratio of Librarians to Support Staff

Year		Catal.	Tech.	Public	Coll.	Admin.	Library
1973	Librarians	18.00	20.00	63.00	7.50	7.00	97.50
	Support Staff	88.00	133.00	163.00	3.00	5.00	304.00
	Ratio	0.20	0.15	0.39	2.50	1.40	0.32
1986	Librarians	15.50	23.10	68.90	5.00	6.50	103.50
	Support Staff	62.20	100.20	160.10	4.00	7.00	271.30
	Ratio	0.25	0.23	0.43	1.25	0.93	0.38
Change (%)		22%	53%	11%	-50%	-34%	19%

Table 5.1

Cataloguing Positions Eliminated

	Automation			Other		Total	
Classification	No.	% of Total	Annual Saving	No.	Annual Saving	No.	Annual Saving
Admin. Lib.	0.0	0%	$0	2.0	$89,484	2.0	$89,484
Librarian	1.0	40%	$33,903	1.5	$50,855	2.5	$84,758
Lib. Asst 4	4.0	100%	$89,520	0.0	$0	4.0	$89,520
Lib. Asst 3	2.0	100%	$39,408	0.0	$0	2.0	$39,408
Lib. Asst 2	8.0	73%	$142,368	3.0	$53,388	11.0	$195,756
Lib. Asst 1	8.0	89%	$130,560	1.0	$16,320	9.0	$146,880
Keypunch Op.	1.0	100%	$18,552	0.0	$0	1.0	$18,552
Secretary 2	0.0	0%	$0	1.0	$18,552	1.0	$18,552
Student Asst	2.1	100%	$32,810	0.0	$0	2.1	$32,810
Column Total	26.1	75%	$487,121	8.5	$228,599	34.6	$715,720

The saving in annual salary cost of positions eliminated because of automation ($487,121) is 68% of the total saving ($715,720).

Table 5.2

Cataloguing Positions Added

	Automation			Other		Total	
Classification	No.	% of Total	Annual Cost	No.	Annual Cost	No.	Annual Cost
Lib. Asst 4	0.0	0%	$0	0.8	$16,785	0.8	$16,785
Lib. Asst 3	0.0	0%	$0	1.5	$29,556	1.5	$29,556
Lib. Asst 2	0.0	0%	$0	1.9	$33,812	1.9	$33,812
Column Total	0.0	0.0	$0	4.2	$80,153	4.2	$80,153

No positions were added to the cataloguing staff because of automation.

Table 5.3

Cataloguing Positions Downgraded

	Automation			Other		Total	
Classification	No.	% of Total	Annual Saving	No.	Annual Saving	No.	Annual Saving
Admin. Lib.	1.0	100%	$10,839	0.0	$0	1.0	$10,839
Keypunch Op.	1.0	100%	$756	0.0	$0	1.0	$756
Column Total	2.0	100%	$11,595	0.0	$0	2.0	$11,595

All downgrading was due to automation.

Table 5.4

Cataloguing Positions Upgraded

	Automation			Other		Total	
Classification	No.	% of Total	Annual Cost	No.	Annual Cost	No.	Annual Cost
Lib. Asst 4	2.0	100%	$23,046	0.0	$0	2.0	$23,046
Lib. Asst 3	3.0	43%	$8,028	4.0	$10,704	7.0	$18,732
Lib. Asst 2	3.0	100%	$5,724	0.0	$0	3.0	$5,724
Column Total	8.0	67%	$36,798	4.0	$10,704	12.0	$47,502

The annual salary cost for automation-related upgrading ($36,798) accounts for 77% of the total annual upgrading cost ($47,502).

Table 5.5

Cataloguing Positions Transferred (Included with Eliminated Positions)

	Automation			Other		Total	
Classification	No.	% of Total	Annual Saving	No.	Annual Saving	No.	Annual Saving
Admin. Lib.	0.0	0%	$0	2.0	$89,484	2.0	$89,484
Librarian	0.0	0%	$0	1.0	$33,903	1.0	$33,903
Lib. Asst 4	1.0	100%	$22,380	0.0	$0	1.0	$22,380
Lib. Asst 2	2.0	40%	$35,592	3.0	$53,388	5.0	$88,980
Lib. Asst 1	1.0	100%	$16,320	0.0	$0	1.0	$16,320
Column Total	4.0	40%	$74,292	6.0	$176,775	10.0	$251,067

The annual value of positions released for transfer to other divisions for automation-related reasons ($74,292) is 30% of the total value of positions released for transfer ($251,067).

Table 6

Summary of Changes in Cataloguing Staff Positions and Costs

	Automation		Other		Combined	
Positions	Decr. (Incr.)	Cost Change	Decr. (Incr.)	Cost Change	Decr. (Incr.)	Cost Change
Eliminated	26.1	$487,121	8.5	$228,599	34.6	$715,720
Downgraded*	0.0	$11,595	0.0	$0	0.0	$11,595
Upgraded*	0.0	($36,798)	0.0	($10,704)	0.0	($47,502)
Added	0.0	$0	(4.2)	($80,153)	(4.2)	($80,153)
Net Total	26.1	$461,918	4.3	$137,742	30.4	$599,660
Change (%)	86%	77%	14%	23%		
Mean Net Saving per Position		$17,698		$32,033		$19,726

*The downgrading or upgrading of positions did not result in an increase or decrease in the number of cataloguing positions.

Table 7

Cataloguing Labor Costs for 1973 and 1986 in 1986 Salary Dollars

Classification	Mean Annual Salary	1973 Staff	1973 Cost	1986 Staff	1986 Cost
Admin. Librarian	$44,742	5.0	$223,710	2.0	$89,484
Librarian	$33,903	13.0	$440,739	13.5	$457,691
Subtotal		18.0	$664,449	15.5	$547,175
Library Assistant 5	$24,300	2.0	$48,600	2.0	$48,600
Library Assistant 4	$22,380	17.0	$380,460	18.8	$419,625
Library Assistant 3	$19,704	27.0	$532,008	22.5	$443,340
Library Assistant 2	$17,796	24.0	$427,104	12.9	$229,568
Library Assistant 1	$16,320	15.0	$244,800	6.0	$97,920
Keypunch Operator	$18,552	2.0	$37,104	0.0	$0
Secretary 2	$18,552	1.0	$18,552	0.0	$0
Subtotal		88.0	$1,688,628	62.2	$1,239,053
Student Asst (FTE)	$15,624	3.1	$48,434	1.0	$15,468
Grand Total		109.1	$2,401,511	78.6	$1,801,696

Table 8

Net Cataloguing Labor Cost Reduction in 1986 Salary Dollars

Classification	Mean Annual Salary	Decrease (Increase)	Annual Saving
Administrative Librarian	$44,742	3.0	$134,226
Librarian	$33,903	(0.5)	($16,952)
Subtotal		2.5	$117,275
Library Assistant 5	$24,300	0.0	$0
Library Assistant 4	$22,380	(1.8)	($39,165)
Library Assistant 3	$19,704	4.5	$88,668
Library Assistant 2	$17,796	11.1	$197,536
Library Assistant 1	$16,320	9.0	$146,880
Keypunch Operator	$18,552	2.0	$37,104
Secretary 2	$18,552	1.0	$18,552
Subtotal		25.9	$449,575
Student Assistant (FTE)	$15,624	2.1	$32,810
Grand Total		30.5	$599,660

Table 9

Adjusted Number of Cataloguing Staff Using 1986 Working Hours

Classification	1973 Adjusted	1986	Increase (Decrease)	Change (%)
Administrative Librarian	5.5	2.0	(3.5)	-64%
Librarian	14.3	13.5	(0.8)	-5%
Subtotal	19.7	15.5	(4.2)	-21%
Library Assistant 5	2.2	2.0	(0.2)	-10%
Library Assistant 4	18.9	18.8	(0.2)	-1%
Library Assistant 3	30.1	22.5	(7.6)	-25%
Library Assistant 2	26.7	12.9	(13.8)	-52%
Library Assistant 1	16.7	6.0	(10.7)	-64%
Keypunch Operator	2.2	0.0	(2.2)	-100%
Secretary 2	1.1	0.0	(1.1)	-100%
Subtotal	98.0	62.2	(35.8)	-37%
Student Assistant (FTE)	3.1	1.0	(2.1)	-68%
Total Staff	120.8	78.6	(42.2)	-35%

Actual 1973 figures have been adjusted to account for the fact that staff worked longer hours in 1973. The adjusted figures give the number of staff required if staff in 1973 had worked 1986 hours.

Table 10

Cataloguing Production Statistics

Before Automation	1971-72	1972-73	1973-74	Mean
Original catal. (titles)	23,015	20,468	18,693	20,725
Derivative catal. (titles)	38,893	34,549	30,345	34,596
Serials catal. (titles)	2,243	2,335	1,790	2,123
Nonbook catal. (titles)	2,908	2,129	3,493	2,843
Reclassifications	6,937	8,185	7,827	7,650
Added copies processed	23,729	24,406	17,580	21,905
Added volumes processed	28,370	31,406	22,738	27,505
Titles searched	144,749	124,179	111,776	126,901
Cardsets produced	98,310	83,827	90,782	90,973
Cards filed	1,593,113	1,589,163	1,643,750	1,608,675
Items processed	180,832	170,823	115,784	155,813

After Automation	1983-84	1984-85	1985-86	Mean
Original catal. (titles)	10,281	11,008	6,630	9,306
Derivative catal. (titles)	42,498	44,010	35,637	40,715
Serials catal. (titles)	2,300	2,374	1,798	2,157
Nonbook catal. (titles)	12,200	7,685	6,256	8,714
Reclassifications	1,529	1,781	1,157	1,489
Added copies processed	12,955	12,741	11,098	12,265
Added volumes processed	21,457	23,346	22,984	22,596
Titles searched	104,531	110,836	100,863	105,410
Cardsets produced	6,481	4,679	4,710	5,290
Cards filed	219,506	197,403	165,598	194,169
Items processed	126,318	118,792	108,675	117,928

Change in Production	Increase (Decrease)	Change (%)
Original catal. (titles)	(11,419)	-55%
Derivative catal. (titles)	6,119	18%
Serials catal. (titles)	35	2%
Nonbook catal. (titles)	5,870	206%
Reclassifications	(6,161)	-81%
Added copies processed	(9,640)	-44%
Added volumes processed	(4,909)	-18%
Titles searched	(21,491)	-17%
Cardsets produced	(85,683)	-94%
Cards filed	(1,414,506)	-88%
Items processed	(37,885)	-24%

Table 11

Comparison of Annual Cataloguing Production per Staff Member

Description	1973 (Mean)	1986 (Mean)	Incr. (Decr.)	Change (%)
All catal. (titles/librarian, LA4, LA3)	989	1,098	109	11%
Original catal. (titles/librarian)	1,052	600	(452)	-43%
Derivative catal. (titles/LA4 and LA3)	706	986	280	40%
Nonbook catal. (titles/librarian and LA4)	74	254	180	245%
Reclassifications/librarian and LA4	198	43	(155)	-78%
Added copies processed/LA3	728	545	(183)	-25%
Added volumes processed/LA3	914	1,004	90	10%
Titles searched/LA4 and LA3	2,590	2,552	(38)	-1%
Items processed/LA1	9,330	19,655	10,325	111%

The mean production figures for 1971-74 and for 1983-86 were used.
The 1973 adjusted staff figures were used.

Table 12

Comparison of Total Cataloguing Labor Cost per Unit of Production

Description	1973	1986	Incr. (Decr.)	Change (%)
All titles catalogued	$35	$29	($6)	-18%
Original Cataloguing (titles)	$116	$194	$77	66%
Derivative cataloguing (titles)	$69	$44	($25)	-36%
Nonbook cataloguing (titles)	$845	$207	($638)	-76%
Reclassifications	$314	$1,210	$896	285%
Added copies processed	$110	$147	$37	34%
Added volumes processed	$87	$80	($8)	-9%
Titles searched	$19	$17	($2)	-10%
Items processed	$15	$15	($0)	-1%

NOTE: This table does NOT give the actual labor cost per unit of production, but merely a ratio for comparison derived by dividing the total annual labor cost of the cataloguing divisions in turn by the total units produced in each category.